

Bartholow (R.)

EXPERIMENTAL INVESTIGATIONS

INTO

THE ACTION AND USES

OF THE

Bind this cover in front,
BROMIDE OF POTASSIUM;

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EXPERIMENTAL INVESTIGATIONS

INTO

The Action and Uses of the Bromide of Potassium.

THE specific or essential properties of the bromide of potassium are derived from the bromine. This inquiry will, therefore, embrace the actions and uses of bromine, alone, as well as in combination with potassium.

These investigations will be conducted in three directions viz.:

- 1st. Chemical properties ;
- 2d. Physiological effects ;
- 3rd. Therapeutical uses.

The actions and uses of bromine might also be studied from the rational and empirical points of view, since some of the uses of this agent are derived directly from its chemical and physiological actions, and others have been discovered by its empirical employment. I prefer the former method, because of its scientific accuracy, and for the further reason that a rational therapeutics whenever attainable, is preferable to a blind empiricism.

I.—CHEMICAL PROPERTIES.

Bromine is a brownish-red liquid possessing a nauseous taste and a disagreeable odor. Its name is derived from the Greek word for fetid, *bromos*. It acts energetically upon coloring matters and effaces them, or, rather, substitutes a yellowish-brown. It is irritant to the bronchial mucous membrane, producing spasm of the glottis and suffocative cough. Its poisonous effects are readily induced by inhalation.

Bromine volatilizes easily. Some drops of it thrown into a glass globe of air, will fill it with orange yellow vapors. It boils at 145° and the specific gravity of its vapor is 5.6. A

wax taper burns in the vapor with a green light but is quickly extinguished.

Bromine is slightly soluble in water, quite soluble in alcohol, and soluble in all proportions in ether. Maintained in contact with water at 32°F., it forms a solid crystallizable hydrate, in which state it continues up to about 45°F.

In some of its properties bromine resembles chlorine; it has the same affinity for hydrogen; it bleaches coloring matters; at a red temperature it decomposes the vapor of water producing brom-hydric acid and oxygen; but it is much less energetic in its chemical relations than chlorine, which displaces it in all of its combinations. As bromine colors starch an orange-red, this reaction may serve to distinguish bromine from chlorine which is without action on starch.

Chloroform agitated with an aqueous solution of bromine is colored a more or less dark red, according to the quantity contained in the solution. When the chloroform solution is agitated with a solution of potassa, it is decolorized, but the color is restored on neutralizing the alkali with an acid. Sulphide of carbon comports itself in solution with bromine in a similar manner to chloroform, except when the red color is destroyed by an alkali, an acid does not restore it.

The bromide of potassium is a colorless salt, very soluble in water. It crystallizes like the chloride of potassium, in cubes and rectangular prisms. The crystals decrepitate when heated, fusing in a mass without decomposition. The bromides are recognized by their solutions acquiring a yellow color and the odor of bromine, when a solution of chlorine is poured into them, or by heating them with sulphuric acid and peroxide of manganese, when bromine escapes.

II.—PHYSIOLOGICAL EFFECTS.

The vapor of bromine when inhaled is very irritant. It induces an inflammation of the schneiderian mucous membrane closely resembling catarrh which may last several days. It causes great irritation of the bronchial mucous membrane, spasm of the glottis and cough of a suffocative character, when inhaled in large quantities. Largely diluted with air, it

may be respiration without danger; it then occasions some heat of the respiratory organs, increased flow of mucus and a sense of fullness and distension of the chest. Long continued respiration of the vapor induces stupor, slow action of the heart and muscular weakness. As the vapor rapidly diffuses itself through the air, notwithstanding its great specific gravity, these effects may be experienced by simply removing the glass stopper of the bottle containing it, when in a few minutes, if the apartment be not too large, the vapor of the bromine will be discovered in every part of it. Swallowed in poisonous doses, it corrodes the mucous membrane of the mouth, pharynx, esophagus and stomach; the vapor passing into the larynx induces violent irritation of the trachea and bronchi and congestion of the lungs. To the effects of an irritant poison are superadded, the impression upon the nervous and arterial systems—depression of pulse, temperature and respiration, and stupor.

My investigations were directed, mainly, to ascertain the physiological effects of the bromide of potassium, as this is the form in which the bromine is usually administered.

Experiment 1.—Took twenty grains of bromide of potassium at 4 p. m. Pulse at this time 72. At 6 p. m. I experienced a sense of fullness of the head, became drowsy and had some confusion of ideas. Pulse had fallen to 65. There was also some dryness of the throat, and a metallic taste in the mouth. At 8 p. m., pulse had risen to 69, and the symptoms induced by the drug had nearly disappeared. Passed at this time eight ounces of urine, which, on examination, was found to contain a trace of bromine in combination. It had, therefore, made the round of the circulation and appeared in the urinary secretion within a space of four hours.

Took again at 9 p. m. twenty grains of bromide of potassium; pulse 70. Became drowsy; retired at 10 p. m., and fell asleep immediately, sleeping heavily for two hours when I awoke, became restless and suffered with headache. Had headache and nervous tremors in the morning, due not so much to action of the remedy as to want of sleep. Appetite keen.

Passed fourteen ounces of urine, which also contained traces of bromine.

Experiment 2d.—Took at 9 P. M. on the following day forty grains of bromide of potassium. Laid down immediately thereafter. Pulse whilst in the recumbent posture 61. Temperature of body as measured by thermometer in the axilla 98.2 F. Experienced in a half-hour frontal headache, and irritation of the schneiderian mucous membrane with increased flow of mucus and sneezing. At the end of one hour had a sense of heat and burning at the epigastrium and pain between the scapulae. Experienced also, confusion of ideas and intoxication, evidenced by impaired locomotion, and tremblings of the muscles. Temperature of the axilla at the end of an hour 98 $\frac{1}{2}$, but a sense of refrigeration was felt over the body. Pulse at this time (10 P. M.) 60, but in a half hour 55, the temperature continuing at 98. Slept continuously during this night a heavy slumber without dreams; had headache on the following day, but there was no disturbance of digestion.

An examination of the urinary secretion after these two trials disclosed the very interesting fact that the quantity of urea notably diminished under the use of the bromide of potassium; whilst the amount of urea contained in 1000 grains of urine was, on the day preceding the use of the bromide, twenty-two grains, on the day after it was only fifteen grains, the diet remaining the same.

The physiological effects of the bromide, when taken in this way, may be thus summed up:

1. It proves irritant in large doses to the mucous membrane of the stomach;
2. It is rapidly absorbed into the blood, and may be detected soon after in the urine;
3. It acts upon the nervous centres, producing sedation, sleep, reduces the action of the heart and arteries, lowers the temperature and diminishes the retrograde metamorphosis of tissue.

To ascertain the effect of the long continued use of the bromide of potassium, further experiments became necessary.

Experiment 3d.—For this experiment a patient was selected who was in the hospital under treatment for spermatorrhœa, and a private patient suffering from the same malady. They were given twenty grains of the bromide dissolved in water, three times each day. As far as could be learned, similar effects were experienced as in the experiments already detailed. The subjective sensations of the patients were, however, not readily drawn from them. Somniferous effects were experienced in each case. One of them slept soundly in the afternoon who was not in the habit of doing so, and complained that he could not keep awake. Loss of sexual appetite occurred after a variable period, but in neither instance until the remedy had been administered from five to ten days. In both cases a papular eruption appeared on the face and forehead.

Beside the anaphrodisiac properties, muscular weakness, shortness of breath, dizziness and diminished mental power, were produced. All of these symptoms disappeared in a short time after the discontinuance of the drug. Some of them were, probably, due to the local irritant action of the bromide and the consequent interference with the primary assimilation

The effect of the bromide upon the urinary secretion was not very marked. The specific gravity in experiments one and two was 1022 after the use of the bromide, which was the same as before its use. In a case of paraplegia at St. John's Hospital due to myelitis of that part of the cord below the dorso-lumbar enlargement, the urine which was alkaline, became acid on the use of the bromide and was notably increased in amount, but this effect was not due so much to any diuretic action of this remedy as to its influence over that morbid condition of the cord upon which the alkalinity depended.

The physiological effects of bromide of potassium due to its prolonged administration, may be summed up as follows:

- 1st. It diminishes and ultimately, entirely, neutralizes the sexual appetite;
- 2nd. It produces weakness of the muscular system;
- 3rd. It is irritant to the stomach if given in considerable doses, and

4th. It interferes with the secondary assimilation, lessening the retrograde metamorphosis of tissue.

III.—THERAPEUTICAL USES.

The applications of bromine to the treatment of disease, are based upon its chemical and physiological properties. This fact is the more conspicuous when we come to consider its uses as a hygienic agent and as a local or external remedy, and as a curative agent in certain constitutional conditions. It will be useful to keep these facts in view, not only as serving to explain the *modus operandi*, but as a guide to rational therapeutics.

a. As a disinfectant and deodorizer.—It has already been remarked that bromine decomposes the hydrogen compounds. These compounds enter largely into the composition of noxious effluvia, arising from animal or vegetable decomposition. The action of bromine may be illustrated by pouring the vapor of bromine into a jar containing sulph-hydric acid gas (or sulphuretted hydrogen); the nauseous odor of this gas is immediately destroyed, sulphur is precipitated, and brom-hydric acid is formed. The poisonous properties of the gas, of course, disappear with the destruction of its chemical properties.

The use of bromine as a disinfectant and deodorizer is predicated upon this chemical property. The only or chief objection to its employment is its cost, which will prevent its substitution for chlorine and other cheaper disinfectants. It is more readily applied than any other agent of its class; it is only necessary to remove the glass stopper of the bottle containing it, when the vapor will diffuse itself throughout the apartment. In small apartments and in private houses; in water-closets and close-stools, it commends itself to our use as an elegant and effectual disinfectant and deodorizer.

As a deodorizer, the solution in the proportion of one part to six of alcohol and water, may be employed in ozœna, to correct the fetor and act as a gentle stimulant; also, in offensive vaginal discharges, and in foul abscesses. In these cases, the solution may be injected into the cavities by means of a glass syringe, the strength being varied according to the necessities in each case.

b. As an escharotic.—When more powerful as well as permanent effects are desired, pure bromine may be applied to the diseased surface. It occasions the death of the part, but the resulting eschar is quite superficial. As an escharotic, it is indicated in sloughing and gangrenous ulcers; in phagedenic chancres; in hospital gangrene; in epithelioma. In callosus ulcers of the leg; in rodent ulcers, syphilitic or from other causes, of the fauces; in syphilitic fissures of the tongue with indurated edges; in syphilitic condylomata, warts or excrescences, and in indolent venereal ulcers, it may be applied pure or more or less diluted with ether or alcohol, according to the special indications in each case.

In all of these forms of disease, bromine has been largely employed by army surgeons, since it was proposed by Dr. Goldsmith for hospital gangrene. Its employment in these cases has frequently degenerated to the merest empiricism. In pseudo-hospital gangrene especially, as well as in true hospital gangrene, has it been used without discrimination. Whilst the former is largely dependent upon a constitutional dyscrasia compounded of scorbutus, malarial poisoning and crowd poisoning, the latter is the direct result of contagion. The former may be cured by supporting treatment, without local applications, and the latter by escharotics and other suitable local applications, without constitutional remedies. Bromine is applicable to the latter. Much harm has resulted from its injudicious employment in the former. I have known the eschar produced by bromine confounded with a new invasion of the gangrene and a renewed application of the remedy ordered.

Dr. Goldsmith very properly insists, that the sloughs be carefully dissected off, before the bromine is applied. The same rule is equally important in the application of other escharotics. Bromine has the advantage over many of them, that it is a powerful deodorizer as well as escharotic, but its superiority in other respects is by no means conclusive.

c. As an internal remedy.—The irritant effects of pure bromine restrict its internal administration. It has long been employed under the designation of “Von Bibron’s antidote”

as a remedy for the rattlesnake poison. The instances of its successful administration were so numerous as to authorize its introduction into the standard supply table of troops operating upon "the plains." For this purpose it is applied locally to the wound, and administered internally. Some interesting experiments have been made upon dogs, to show that bromine decomposes the rattlesnake poison and renders it innocuous. With the same view it has been proposed in hydrophobia, but I know of no instances in which it has been employed. Its efficacy as an antidote to the poison of the rattlesnake, affords a reasonable ground of belief that it may prove antidotal to other specific animal poison. At all events, this subject is worthy of investigation.

In diphtheria and membranous angina it has been employed with benefit, applied locally in solution and by inhalation, and administered, also, by the stomach. Recently some remarkable results have been obtained by administration of bromine internally in camp dysentery, a condition of the alimentary canal analogous in some respects to the local condition in diphtheria.

The chief difficulties in the way of the administration of pure bromine, are, its ready volatility, its nauseous taste, and its irritant and corrosive action. These objections may be measurably removed by dissolving it in alcohol or ether; one part of bromine, for example, may be dissolved in six parts of alcohol or ether, of which five drops may be given and gradually increased until some of its characteristic irritant effects are produced.

d. The actions of the bromide of potassium physiologically considered, consist in a sedative or contra-stimulant effect upon the nervous centres, producing as secondary phenomena, sedation of the heart, anaemia of the brain, anaphrodisiac effects and diminution of the retrograde metamorphosis of tissue. It has come into use in various functional and organic nervous disorders and in certain sexual diseases, where a calmative and sedative influence is desired.

1. As a hypnotic.—The experiments already detailed, have shown that as one effect of bromide of potassium a disposition

to sleep or drowsiness follows its administration. This action is not to be considered independently of its effects upon the pulse-rate and temperature, both of which are notably diminished. To comprehend its hypnotic effects, therefore, we must clearly understand the conditions under which insomnia may exist. It is but recently, indeed, that the state of the brain in healthy sleep has been definitely traced. We are indebted for correct views on this subject to Mr. Durham, of England, and Dr. W. A. Hammond, of New York, who have shown that the brain in healthy sleep, is in the same condition as other organs in a state of repose; that is, it contains less blood, it shrinks and occupies a relatively smaller space, or in other words it is anaemic. The view, heretofore held by physiologists and pathologists, was the opposite of this; the state of sleep was presumed to be induced by congestion of the brain, by greater fullness of its vessels, and that sleep was in reality, a modified coma. The hypnotics heretofore employed tended to confirm this view, for nothing is more evident than that opium, cannabis indica and other narcotics, produce congestion of the brain. Hence they induce, if given in sufficient doses to procure sleep, the pathological state of coma rather than the physiological state of natural sleep.

The bromide of potassium is a true hypnotic; it makes a sedative impression upon the nervous centres, and diminishes the cerebral blood-supply, conditions essential to healthy sleep.

To determine this fact, and at the same time to ascertain the antagonism between opium and bromide of potassium, observed when the two were administered in a case of disease conjointly, I made the following experiment:

Experiment 4.—Took at 8 P. M. thirty grains of bromide of potassium and forty drops of tincture of opium. Pulse 70; temperature 98.3°. In a half hour pulse was 68 and temperature 98.1°; in an hour pulse 65 and temperature 98. Before 9 o'clock experienced headache and burning at the epigastrium, but after this hour felt the characteristic impressum of opium; pulse rose to 72 and temperature to 98.5°. The opium produced as it does constantly in my case, insomnia or the half-

waking state, which lasted during the whole time its effects continued.

This experiment was, therefore, entirely confirmatory of the clinical observation. It follows then as a rule of practice, that when the hypnotic effect of the bromide of potassium is desired opium should not be administered. It follows, also, that if the state of congestion of the brain or modified coma induced by opium, prevents the action or contra-indicates the employment of the bromide of potassium, as a hypnotic, that it is not adapted to cases of insomnia arising from congestion of the brain. Several clinical observations confirm this view.

Experiment 5.—To a patient at St. John's Hospital in the *delirium ferox* of typhoid fever, I administered sixty grains of the bromide of potassium in six hours in divided doses. No effect whatever was produced; his delirium and excitement continued unabated, and he died on the third day thereafter. Upon *post-mortem* examination I found extensive congestion of the veins of the cranial cavity, numerous bloody points on division of the white substance; fluid in the sub-arachnoid space and fluid in the ventricles. His delirium and insomnia were plainly due to this extreme congestion of the brain and its meninges, and over this state the bromide of potassium exerted no control.

The same fact is exemplified in

Experiment 6.—This was also a case of typhoid fever. Insomnia had existed for several nights and days. The case commenced with brain trouble, and although this was apparently relieved, the insomnia continued. Ninety grains of the bromide were administered in twelve hours without inducing sleep. The man ultimately recovered; but that the insomnia was due to congestion or organic lesion of the brain, is rendered probable by the fact, that he suffered from ptosis and paralysis of the *portio dura* during the stage of convalescence.

Further, this remedy is not adapted to cases in which opium is used with advantage. It would be idle to administer it as a hypnotic in cases of severe pain. From these negative conclusions the results of experiment and clinical observations, we are enabled to arrive at some positive indications.

The bromide of potassium is indicated as a hypnotic in states of nervous excitement without congestion of the nervous centres; in hysterical insomnia; in delirium tremens; in the insomnia of excitable business men, or in general terms, in those forms of insomnia dependent upon excitation without increased blood supply.

Its use in the treatment of delirium tremens will sufficiently illustrate this point. Six cases of this disease have recently been treated by me in St. John's hospital with the bromide of potassium. The method of its use has been as follows: thirty or forty grains were given in the evening in divided doses; during the day milk and beef tea, and a small quantity of wine and water or whisky and water as a *placebo*, merely. The average duration of these cases was three days. The bromide invariably produced sleep from three to eight hours during each night of its administration. All of the cases recovered. I am aware that Bennett claims a most favorable result from his nutrient plan of treatment without medication, but the good effects of the bromide in these cases were too constant and uniform for the *post hoc* to have been mistaken for the *propter hoc*. It must not be forgotten, however, that the bromide may fail of its hypnotic effects in delirium tremens, in those cases characterized by organic lesions of innervation, by inflammation and its products, or by active sthenic congestion. Such an exception must occur very rarely, for delirium tremens is very constantly a state of excitation without power.

Again, to secure the most favorable results from the use of the bromide it is important to withdraw the stimulant. To continue the poison which produced by its direct action on the nervous tissue, all the nervous phenomena is not only unphilosophical and illogical, but is practically harmful. It will prevent the beneficial effect of the hypnotic. In my cases I used a small quantity of wine merely as a *placebo*, to allay the patient's fears on account of the sudden withdrawal of his accustomed stimulant, but not sufficient to act upon his nervous centres and to produce that state of active congestion unfavorable to the action of the bromide.

2. *As a sedative.*—It has already been shown that the bro-

mide of potassium given in sufficient doses reduces the pulse and temperature. It is also sedative to the nervous system. This action has been indicated in the physiological experiments detailed and confirmed by clinical observation. The remedy has, consequently, been largely employed empirically. Its therapeutical uses, as a nervous sedative, have well defined limits. It is not applicable to all forms of the several nervous disorders in which it is found useful.

The last observation is particularly appropriate to the use of the bromide in epilepsy. It has been given in the centric and excentric forms of the disease, with little regard to the actual condition. In epilepsy dependent upon functional derangement of the sexual system, its good effects are frequently most conspicuous. To insure a permanent curative effect it is essential that any local lesion upon which the convulsive action depends, must be remedied. In the following case for reasons not necessary to mention, the amenorrhœa, the excentric cause of the convulsions was incurable, and hence, the failure of the remedy after a decided manifestation of its peculiar powers.

Experiment 7.—This case, a chlorotic girl, suffered with daily attacks of epileptiform convulsions. The bromide of potassium, in ten-grain doses, three times a day, was administered with the effect to prevent the recurrence of the convulsions for a space of three weeks, when they again returned with their former frequency, and larger doses failed of effect. It is especially useful in the epileptiform convulsions of masturbation, for, in this case, as we have already seen, it is sedative to the sexual, as well as to the nervous system. In this form of epilepsy, the irritation starts from the peripheral nerve distribution of the genital organs. This irritation and the excitation which it produces in the cerebro-spinal axis, are both largely under the control of the bromide, and hence its peculiar efficacy in such cases. But where in other cases the peripheric origin of the convulsions is equally evident, this remedy can only relieve the excitation of the cerebro-spinal axis, or, in other words prove merely palliative. Hence the frequent failure of the bromide in this class of cases, the

peripheric local lesions remaining undiscovered or proving incurable.

There is yet another class of cases to which it is not applicable—those of centric origin dependent upon tumors, injury or structural lesion. If there be any cases of centric origin in which the bromide proves curative they are probably those of increased reflex excitability without structural lesion.

To illustrate further the important therapeutic principles embraced in these observations on epilepsy, I add the following case of chorea:

Experiment 8.—A boy, ten years of age, presented himself at the clinic of the Medical College of Ohio, suffering under chorea, involving especially the right side. His mother, who accompanied him, stated that he had, beside the choreic jactitations, more or less mental derangement. I prescribed for him ten grains of the bromide of potassium in a half-ounce of infusion of Cimicifuga to be taken thrice daily. He presented himself on the following week, somewhat relieved, but by no means cured. His mother stated on this occasion that since his previous visit he had vomited a worm. Acting upon this information, Dr. Nickles, the physician then in attendance, prescribed santonine, which procured the evacuation of the worms, and the boy thereafter rapidly recovered.

The sedative effects of the bromide are exhibited in a variety of functional nervous disorders, non-specific in character. Thus it has come largely into use in spasmodic cough, of which the following case, a type of a large class, is a good example:

Experiment 9.—A boy, an out-door patient of St. John's Hospital, had diffused catarrhal bronchitis of several months standing. His chief trouble, however, consisted in violent paroxysmal cough occurring at irregular intervals, and especially at night. He was given the bromide of potassium conjointly with the iodide thrice daily. After a few doses the cough subsided, and when he last presented himself, the bronchitis had entirely disappeared.

In other nervous and spasmodic affections of the respiratory organs, not due to a specific cause, as cough, asthma, and irritable larynx, it is frequently beneficial. Hence the bromide

has acquired some reputation for producing a state of partial anaesthesia of these organs ; but its *modus operandi* consists in the sedative impression upon the medulla oblongata conveyed through the pneumogastric and its branches, especially the laryngeal. It is this peculiar sedative action which has led to the employment of the bromides of potassium and ammonium in whooping-cough. The almost constant failure of the drug to relieve any other symptom than the spasmodic element—the whoop—follows from what I have said as to its *modus operandi*, for the bromide is not an antidote to the peculiar poison or influence producing the disease. Reputed cures were probably instances of the natural termination of whooping-cough, for, in common with all other nervous diseases, it is exceedingly irregular in its severity and duration.

As a sedative, the bromide of potassium is also largely employed in certain disorders of the sexual system, both of males and females. Thus it has been used with excellent results in uterine and ovarian irritation, in priapism, in irritable bladder and in gleet.

I have found it especially useful in irritable bladder and the chordee of gleet. The following case well exhibits this :

Experiment 9.—A man presented himself at the College clinic with gleet of several months standing. He had a thin discharge without inflammation ; he suffered from painful erections ; he had irritable bladder which required him to get up frequently during the night. He was given twenty-grain doses of the bromide. His cure was rapid and complete. The subsidence of the gleety discharge, as well as the relief of the irritable bladder, was a gratifying exhibition of the power of the remedy, for all practitioners have experienced the great difficulty of curing such cases.

It is not equally efficacious in the chordee of acute gonorrhœa, nor in the irritable bladder of cystitis and calculus. In both these conditions, however, it will prove occasionally, very beneficial, and always palliative.

In irritable uterus and ovaries it will relieve many of the most distressing symptoms, and often prove curative without the addition of any other remedy.

3. *As an anaphrodisiac.*—No therapeutic use of this drug rests upon better established facts than its anaphrodisiac properties. The experiments on this point have been conclusive!

Experiment 10.—A private patient afflicted with spermatorrhœa, took twenty grains at 6 and at 9 p. m. for ten days, with the effect to deprive him entirely of sexual desire, but this effect was not produced by the first six doses.

In cases of spermatorrhœa, this desirable effect is not alone sufficient. In my cases, I conjoin with the anaphrodisiac property of the bromide, the peculiar effects of ergot and belladonna upon the spinal cord. I can speak with confidence as to the great value of this plan of treatment in spermatorrhœa—a disease most difficult to cure, as all physicians have learned who are at all familiar with its management.

The good effects of the bromide in this, as in all other forms of nervous disease, are largely influenced by local conditions. If the sexual excitement be dependent upon disease of any part of the cerebro-spinal axis, or upon some local structural lesion in the generative apparatus, the same beneficial results can not be expected.

After a careful survey of all the facts we are able to construct a theory of the action and *methodus medendi* of the bromide of potassium. I put this in the shape of the following conclusions :

1. The bromide of potassium acts by absorption into the blood;

2. Its effects are expended upon the nervous centres, or the cerebro-spinal axis;

3. Sedation of the heart and circulation, and the various local sedative effects are secondary results of the impression made upon the nervous centres;

4. Its physiological effects are not very decided, and are easily modified by any local disturbance;

5. Its therapeutical action is still more decidedly influenced by local morbid processes;

6th. It is indicated where a sedative to the nervous system is required—in insomnia; too great reflex excitability; nervous and spasmodic affections of the larynx and bronchi; sexual excitement and in an irritable state of the sexual organs;

7th. It will be effectual in the foregoing conditions, in proportion to the degree in which structural lesions are absent, or in other words, in proportion to the degree in which these morbid states are functional rather than organic.

4. *Therapeutic Value of the Bromide of Potassium as an Alterant, compared with the Iodide.*—It has been assumed that the bromide exerts an alterant power corresponding to that unquestionably possessed by the iodide. This assumption is based, rather upon supposed chemical analogies, than upon actual experiment. I have shown in Section I. of this paper, that in its chemical relations, bromine is more nearly allied to chlorine than to iodine, and most probably, in its physiological relations, also.

Some satisfactory trials have been made under this head. No therapeutic effect is more definitely established than the alterant action of the iodide of potassium in the tertiary forms of constitutional syphilis. If the bromide possesses analogous powers, they should be exhibited in this disease. The following cases will illustrate the comparative value of the two remedies.

Experiment 11.—This patient, a female, in the private practice of Dr. I. S. Dodge, of this city, had contracted syphilis from her husband, and suffered under tertiary deposits and ulcerations in almost every tissue of her body, so that her condition seemed to be almost hopeless. Having her under my care during the temporary absence of Dr. Dodge, I gave her full doses of the bromide of potassium. Little, if indeed any, improvement was manifest after some weeks of this treatment. Subsequently, her disease meanwhile having become much aggravated, Dr. Dodge put her upon full doses of the iodide of potassium, when she rapidly improved, the ulcerations healing, and the nodes and other deposits disappearing.

Experiment 12.—A man, aged 40 years, was admitted into St. John's Hospital with large nodes on the tibia and ulna. He had excruciating nocturnal pains, and his general health was much impaired. Six years ago he had had primary syphilis, and now bears the mark of a chancre on the glans penis. I prescribed sixty grains of the bromide of potassium, daily. This quantity he took for six days without the slightest benefit. His nocturnal pains continued unabated, and the nodular swellings increased rather than diminished. I then ordered forty grains of the iodide of potassium daily, which in forty-eight hours produced the most decided amelioration in his symptoms, relieving entirely the nocturnal pains and sensibly diminishing the periosteal inflammation. He is now rapidly recovering.

It thus appears quite evident that the bromide possesses none of the peculiar alterant property of the iodide. Whilst this fact is true, it is undoubtedly the case that the bromide relieves congestion of certain organs, diminishes their bulk, or, as it may be styled, produces resolution of an engorgement. Such action, apparently alterative or resolvent, is not really so. It has been exhibited mainly in certain states of the uterus and ovaries—states of hyperæmia dependant upon sexual excitement, or upon the monthly nusus. The apparent resolvent power is, in this case, due to the sedative impression of the remedy upon the sexual organs and upon the vaso-motor nerves.

Whatever alterant effects may have been exhibited in respect to other organs, were produced by the sedation of the heart and the vasa-motor nerves, secondary results of the impression upon the nervous centres. These effects are clearly distinguishable from those produced by the iodide, which manifests its peculiar powers without any recognizable disturbance of the secretions and excretions or of any other vital acts, of the organism. In many instances this action of the iodide nearly approaches specificity, and nothing analogous to it, is ever attained by the bromide.



